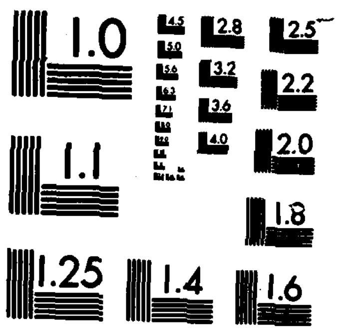
AD-A151 003 PERCEIVED HETEROGENEITY AND ITS EFFECT ON VARIOUS TYPES OF TASKS(U) INDIANA UNIV-PURDUE UNIV AT INDIANAPOLIS R ADAMS-TEREM ET AL. 01 FEB 85 85-1-ONR 1/1

UNCLASSIFIED N00014-83-K-0021 F/G 5/10 NL

END

FILMED

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

AD-A151 003

DTIC FILE COPY

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER ONR 85-1	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Perceived Heterogeneity and its Effect on Varous Types of Tasks		5. TYPE OF REPORT & PERIOD COVERED Final
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Rosemary Adams-Terem, Jeff Fross, Dan Landis, and Robert Hayles		8. CONTRACT OR GRANT NUMBER(s) N0014-83-K-0021
9. PERFORMING ORGANIZATION NAME AND ADDRESS Indiana University Foundation 355 N. Lansing, P. O. Box 647 Indianapolis, IN 46223		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR 170-951
11. CONTROLLING OFFICE NAME AND ADDRESS Organizational Effectiveness Branch Office of Naval Research (Code 452) 800 N. Quincy, Arlington, VA 22217		12. REPORT DATE 1 February, 1985
		13. NUMBER OF PAGES 28
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approval for public release distribution of this report is unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

DTIC SELECTE MAR 0 6 1985 S D E

18. SUPPLEMENTARY NOTES

Cont'd

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Heterogeneity, evaluation pay-offs, effect of culture, task analysis.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study investigated the effects of group composition and evaluation instructions on a motor task, a creative-cognitive task and a cognitive decision-making task. An anonymous group technique was used to control for extraneous variables that are frequently present in small group studies. The subjects were 48 females from undergraduate courses at the University of Hawaii. A 2 X 4 (composition X instruction) ANOVA was computed for performance on each of the tasks. A significant main effect for group, showing

DD FORM 1473 1 JAN 73 EDITION OF 1 NOV 65 IS OBSOLETE

S/N 0102-LF-014-6601

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

85 02 19 100

Perceived Heterogeneity and its Effects on Various Types of Tasks

Rosemary Adams-Terem, University of Hawai'i

Jeff Fross, University of Mississippi

Dan Landis, University of Mississippi
and

Robert Hayles, Office of Naval Research

This study was supported by ONR N0014-83-K-0021 to D. Landis and carried out during Landis' sabbatical leave at the East-West Center. We express our appreciation to Peter Campos and Sheryl Osato for their aid during the running of the study. H.C. Triandis read an earlier version and made many useful suggestions. Requests for reprints should be addressed to D. Landis, Office of the Dean, College of Liberal Arts, University of Mississippi, University, MS 38677. A shorter version was prepared for delivery at the 7th meeting of the International Congress of Cross-Cultural Psychology, Acapulco, Mexico, August, 28 - September 1,1984.

less than

Abstract

This study investigated the effects of group composition and evaluation instructions on a motor task, a creative-cognitive task and a cognitive decision- making task. An anonymous group technique was used to control for extraneous variables that are frequently present in small group studies. The subjects were 48 females from undergraduate courses at the University of Hawaii. A 2 X 4(composition X instruction) ANOVA was computed for performance on each of the tasks. A significant main effect for group, showing improvement under perceived heterogeneous affiliation, was found using the creative cognitive dependent variable($p < .05$). Significant group X instruction interactions were found for the cognitive decision-making task($p < .02$) and the motor task($p < .04$). These findings are addressed in terms of factors inherent in the composition of the groups and nature of the tasks. Implications for future research are outlined and discussed. Originator supplied keywords include:

See DD1473 (Block 19)

Perceived Heterogeneity and its Effects on Various Types of Tasks

It is a well-established fact that most of today's real-world tasks and problems require expertise rarely possessed by a single individual (Spekke, 1975; Toffler, 1980; Naisbitt, 1984). Complicated "brain teaser" problems are solved more quickly and creatively by groups of cognitively heterogeneous persons. Scientific research is more productive when conducted by scientists with some divergence of opinion as to methods and means (Pelz & Andrews, 1976). On another level, homogeneous gene pools among plants and animals are not very adaptable to changing environmental conditions. While there are tasks and environments where homogeneous groups outperform heterogeneous groups (Ziller, 1976), we believe that the existence of a diverse population (age, ethnicity, gender, cognitive styles, personality differences, etc) combined with the existence of complex real-world problems should motivate scientists to learn more about the determinants of effective performance by heterogeneous groups on various tasks. This investigation is part of a series of studies along this theme.

Most of the research in group productivity has focused on two separate variables: the composition of the group in terms of gender, ethnicity, age,or personality (Gurnee, 1937; Heslin,1969; Pelz & Andrews, 1976; Hoffman & Bethouski, 1981; Osato, Campos, Goodman, & Landis, 1983), and the nature of the task(Kent & McGarth, 1969; Mcinturff, Campos, Irving, & Landis, 1983;

Pepinsky, Pepinsky & Pavlik, 1960). It has been well documented that heterogeneous groups outperform corresponding homogeneous groups on a variety of tasks(Ziller, 1976; Hoffman & Maier, 1961). Generally, efforts to assess and predict performance on different tasks have not been conclusive(Freedman, Klevansky & Ehrlich, 1971; Lord, 1976). None of these studies have empirically examined task interaction effects.

Previous studies have entailed assembling the subjects into groups prior to the implementation of instructions, so that the groups can cooperate on the task at hand. Although this may appear to be the most direct application of the task and extraction of the data, it is hardly the most convenient in terms of scheduling, space requirements, and control of ideosynchratic noise that may bias performance in some of the groups.

The present study attempted to control for extraneous noise variables by running subjects individually, yet informing participants that their results would be included in a larger group. This anonymous group technique met with success in an earlier investigation(Schacter, Ellerston, McBride, & Gregory, 1951). Half of our subjects were informed they were part of a heterogeneous group, whereas the other half were instructed that their scores would be included with a homogeneous group. Each subject completed three tasks: a difficult cognitive-decision making task(MAP GAME), a simple behavioral motor task(construction of symbols), and a simple creative-cognitive task(WORD GAME). This provided an empirical measure of task X group composition interaction. The tasks within this paradigm

meet Steiner's (1972) standards for being termed _unitary tasks_(i.e. tasks that cannot logically permit division of labor among group members). In a maximizing situation(where a premium is put on speed of completion) Steiner goes on to say that final group production can be affected by the prevailing evaluation criteria. Four types of criteria: disjunctive, conjunctive, additive, and discrepant were explicated in instructions given to the members of each group. This manipulation permits differential effects on task performance to be assessed. Females with similar backgrounds(Hawaii residents of oriental extraction) were chosen so that any influences due to culture and sex could be controlled for.

A major purpose of this study was to determine if this simpler paradigm could result in similar heterogeneous/homogeneous group differences found in previous studies. Secondly, the above mentioned variables(group composition, task difficulty and perceptions regarding evaluation criteria) have only been studied in single design research. Unstudied as yet is how group productivity is affected by the interactions among these variables.

Method and Procedure

Subjects: Forty-eight females enrolled in undergraduate psychology courses at the University of Hawai'i participated in exchange for course credit. Subject characteristics--including age, ethnic background, percent of friends with similar ethnic background, paternal lineage and maternal lineage--were

distributed equally across cells. Ages ranged from 17 to 38(Median=21), with 66% in the range of 18-22. Seventy-one percent of the subjects were of Japanese-American background or other oriental groups. This distribution ratio approximates the make-up of the Hawaiian population(65% orientals) based on 1980 census figures. Seventy-one percent of the subjects reported that at least 50% of their friends were from similar ethnic backgrounds. Paternal family lines reflecting uniform heritage went back at least as far as 'grandfather' for 77% of the subjects. Corresponding maternal lineage went back at least as far as 'grandmother' for 71% of the subjects.

Dependent variables;: There were three types of tasks: behavioral, creative-cognitive, and cognitive decision- making. The behavioral task had three different elements: tracing, cutting, and shading paper shapes. The materials were a cardboard stencil in the form of a five-pointed star, large sheets of white paper, and drawing pencils for the tracing task; sheets of paper printed with stars and large scissors for the cutting task; and a variety of ready-cut geometrical shapes to be shaded with pencils according to a visually-presented key: stars to be shaded solid, triangles striped and diamonds cross-hatched. The score was the numbers of items completed in the alloted time.

The second type of task, creative-cognitive, consisted of a simple and familar word-game in which the subject is required to form words out of the letters of a given word. Three words ("revolutions", "established", and "contemplate") were used with scores being the number of accepted (found in Webster's

Dictionary) words produced in the alloted time.

The third type of task was more complex task and required the manimpulation of cognitive elements in a decision-making task (Landis and Slivka, 1972 review a number of studies using this task). Subjects were asked to put themselves in the role of a reconnaissance pilot overflying territory vital to an enemy. The aim of the task is to plan a route across the map provided which maximizes profits--represented by variables denoting population size and strategic value of the cities--while minimizing losses--represented by the probability of losing the aircraft to enemy fire, and the probability of finding the enemy in a given city. Subjects had to bear these four variables in mind when planning their routes, and were required to perform some rapid arithmatic calculations to assess the value of the reconnoitered cities in order to achieve a high score. In addition they had to contend with two other requirements: a compulsory return to home base and a penalty for flying over the same city twice. The materials were three schematic maps, each with its own explanatory key, and flight plan sheets for recording the details of their routes. Scores were computed by a formula incorporating both positive and negative factors, and yielding a single numerical value per city. Each subject's average score (sum of city values over the number of cities) was taken in order to normalize the effects of differing strategies. Subjects were given 5-min for each subtask and timed to one-second accuracy.

Independent variables: Subjects were randomly assigned to one of eight groups or cells according to combinations of levels of the two independent variables: type of group and type of

instructions. By "group" we mean whether or not the subject was lead to believe that the others in her group were "just like her" or "very different from her". "Level of instruction" refers to the way in which the pay-offs for the "group" performance was to be computed. The four levels of this variable come from Steiner's (1972) conceptualization: Disjunctive, conjunctive, additive, and discrepant. The specific ways in which these variables were defined to the subject are given below.

Procedure: Subjects were recruited through the undergraduate psychology subject pool as well as by direct appeals in Psychology classes. Prior to being called to participate, each subject completed a lengthy questionaire providing information about demographic, personality, and cultural-attitudinal factors. The sessions were held in a quiet room at the University or in an off campus research building. Each subject was tested individually with sessions lasting from 1 1/4 to 1 1/2 hours.

At the start of the session, the experimenter introduced herself, and briefly explained the purpose of the study. In order to set-up the manipulations, the experimenter read the following instructions:

> You are helping us to study the effectiveness of group-problem solving in what we call an anonymous group. This means that none of your group members will ever actually see or directly communicate with the others. Instead, an experimenter will act as a go-between whenever there is a need for communication between you. The purpose of the study is to examine the effects of operating under just those conditions. We think the results could have far-reaching consequences in the real world. More and more, computerization and specialization of work is leading to the creation of this kind of work group in real life. Decisions are made by the

group without direct or personal contact ever being made between the members of the group. Air traffic control is a good example and military surveillance and computerization in corporations are other areas where our results may be relevant.

To examine the effects of working in this anonymous group setting thoroughly, we have devised three specific duties in three different types of tasks. One task involves the production of paper symbols. You will be asked to trace around a stencil, cut out shapes, or shade them in. Speed is important here because your score will be the number of shapes you can finish in the five minutes I will give you for each job. The other two types of tasks are problem-solving games. In one, you will be given a long word and your task is to make up as many words as you can out of its letters. Again, you need to work quickly because your score will be the number of words you can make up in five minutes. The last task is the most complicated of the three. It is a map game. You have to put yourself in the role of a military strategist, planning to fly a plane over enemy territory to reconnoiter the area. You have to select a route that will give you a high score while trying to avoid some of the dangers, like losing your valuable plane to the enemy. The rules are rather complex, so we'll go over it all in detail when we come to it.

In order to give your group a good chance of performing well on these tasks, we have made certain that all of the members of your group are:

<u>homogeneous group</u>: " carefully matched on all the relevant variables which we could extract from the questionaires that you filled out before, so that you will all be compatible and close on all the things that could affect your performance"

<u>heterogeneous group</u>: " completely randomly selected for all the different people here and on the mainland who completed those questionaires, so that we don't have any bias from having only one type of person in each group"

We have done this very carefully and we have every reason to believe that your group is ("a really well-matched group of similar people" or "a totally random sample group") and from what other people have found in their experiments in this area, it seems that this is the kind of group that scores really well and works really well together.

I will be giving you an envelope containing the test materials. It will have one of the duties for each type of taks, so altogether you will be given three different envelopes today. That makes nine separate tasks. Each subject in your group will be doing the same sort of task, but in a counterbalanced order, and at a different time.

Manipulation of payoff beliefs: Subjects were given one of the following instructions:

To determine the group's final score, we will

Disjunctive: take the best score of the three foreach subtask. This way we use the top scoring individual to represent the whole group and maximize an excellent performance by any one member.

conjunctive: take the lowest score of three for each subtask. This is a reflection of the way things are in real life: a group is only as good as its weakest member.

additive: add together the scores of all three group memberson each subtask. This way each member is given an equal weight in measuring the group's performance.

discrepant: contact all the group members when all the results are in and ask for their views on the most profitable way to use the individual scores in making up a group total. There are several options: you could chose the highest of the three scores on each subtask to represent the group's total, taking advantage of an excellent performance by any one of the individual members. Or, you could take the average of the three scores and even out any difference. You could add the score together and achieve the same result, or you could weight the scores so that highest has a weight of three, the next a weight of two, and the lowest a weight of one, thus maximizing the highest score and minimizing the lowest ones. It will be up to you and your fellow group members to decide, but, of course you won't be asked to do that until all the data are in.

All Ss were then told the following:

In any event the best way to get a high score for the group is for all the individual members to try to score as high as possible on all the subtasks.

We have also decided that when the results are in

> from all of our groups, we are going to see which ones scored the highest overall and give a prize for the best performance. So, if you are lucky and your group comes first, you will have a chance of winning some money. At the end of the experiment, I will ask you to fill out an evaluative questionaire to give us some feedback on how you felt about the experiment.

In the homogeneous condition, the experimenter stressed the general similarity of all subjects and indicated strongly that this was good for group performance. In the heterogeneous condition, stress was placed on the need for dissimilarity among the subjects and it was claimed that this would avoid problems of bias, thus boosting the chances of good group performance.

Each task was then individually introduced and explained. Care was taken to be certain that each subject fully understood what was expected. All subjects did the tasks in a fixed order which had been randomly selected: tracing, word, map; word, cutting, map; or map, shading, word.

On completing the nine tasks, subjects filled out a post-experiment evaluative questionaire. They were asked to guess the similarity--disimilarity of the other members of her group to her on a set of semantic-differential type scales along the following dimensions: age, sex, ethnicity, religion, socioeconomic status, intelligence, personality type, attitudes toward other cultures, degree of liberalism conservatism, and scores on the experimental tasks. These data provide insight into each subject's perception of how similar to and different from their group members they perceive themselves to be. In post-experiment interviews no subjects indicated that they guessed the real purpose of the

experiment.

Analyses of data: Scores were standardized for each subtask (e.g. Map 1) across groups and levels of instruction. After standardization, the scores for a particular subject on a particular task were averaged. These data were then cast in the form of a randomized blocks ANOVA with groups and instructions as the independent variables and the three task-types as dependent variables in separate analyses. Significant effects were further analyzed by multiple t-tests.

Manipulation checks were performed by collapsing over levels of instruction and comparing groups in the post-experimental questionaire.

Results

Manipulation Check: A Univariate Analysis of Variance was performed on a homogeneity/heterogeneity index. Subjects rated perceived similarity of other group members on 10 factors which included age , sex, ethnic background, religion, socioeconomic status, intelligence, cultural attitudes, personality, degree of liberalism, and scores on the experimental tasks. Indices could range from 10(very dissimilar) to 70(very similar). Subjects in the homogeneous conditions rated their fellow members significantly more similar(M=48.42) than did subjects in the heterogeneous groups(M=36.79), $F(1,46)=58.38$, $p<.001$.

Task Results: Table 1 gives the means, and differences between the means, on the Map task for the eight groups. The group by instruction effect was significant ($F(3,40)=4.09$, $p<.013$). Significant cell differences are also shown in Table 1.

Insert Table 1 about here

Both the discrepant and disjunctive conditions produced significantly different effects hetergeneous versus homogeneous group conditions. That is, under disjuctive instructions, the heterogeneous group performed better than the homogeneous one. The reverse was true under discrepant instructions where the homogeneous group did better. Neither the conjunctive or additive instructions were affected by the groups variable, although the additive situation produced higher performance in general than the conjunctive instructions.

Only the group main effect was significant using the word game dependent variable. ($F(1,40)=4.46, p < .05$). This effect was produced by the discrepant and conjunctive conditions (Table 2).

Insert Table 2 about here

The group by instruction interaction was also significant for the construction task data. ($F(3,40)=3.06, p <.04$). Here all instruction conditions performed better in the heterogeneous condition except disjunctive where the effect was reversed (Table 3).

Insert Table 3 about here

The task interactions are shown more clearly in figures 1 and 2, which present the data on the discrepant and disjunctive conditions from tables 1, 2, and 3.

Insert Figures 1 & 2 about here

The three tasks displayed marked changes across group composition in the discrepant instruction condition. These effects were markedly reduced(Word game) or reversed(Map & Construction tasks) under disjunctive instructions.

Discussion

Results of the present study indicated a Main Effect for Group on the Word game task in which perceived heterogeneous affiliation produced a significant improvement. Group X Instruction interactions were found on the Map and Construction tasks. Under disjunctive instructions the heterogeneous group performed better than the homogeneous group. This effect was reversed for the discrepant instructions where the homogeneous group performed better. On the construction task only the homogeneous group receiving disjunctive instructions outperformed its heterogeneous counterpart. A manipulation check showed perceived homogeneity/heterogeneity indices to be significantly different for the two subclasses.

The present data suggest that we need to include at least three theoretical factors in understanding our results. First,

there is task difficulty and familiarity. Related here is saliency of the task to the cultural group. Thus, performance on a cognitive task might be much more important to a group which holds intellectual performance in high regard. Second is the strength of group cohesiveness. Highly cohesive groups may tend to protect their least able members by either enhancing or degrading performance, depending on the criteria used to apportion rewards. The third factor is the ease and desirability of making intra-group comparisons. As Festinger (1954) noted some time ago, social comparison becomes more problematic as one moves away from tasks with clear standards of accomplishment. We can apply these factors to understanding the results from each task.

When interpreting the significant interaction present in the results of the Map task, one must attend to two of our suggested factors: perceived task difficulty and the effect this difficulty will have on the performance of the other group members. The interaction occurs primarily because of the differential effects of discrepant and disjunctive instructions. Remember that disjunctive information entails basing a group's final score on the singular best performance of one of the members. In a homogeneous group this would entail outperforming all of the others in the group which, from some perspectives, could dishonor others. Such a perspective might effect each subject's score in a negative fashion. In a heterogeneous group, this suppresion might not be as salient because the group is composed of people to whom one owes no loyalty (assuming that layalty is absent or miminal in hetergeneous groups). Therefore, the

individual would be likely to work hard even though the task is perceived to be very difficult.

The discrepant information involved the belief that all of the group members would reassemble at a later time and decide on a total group score. The theme is one of group co-operation and eventual fairness. In the homogeneous group the emphasis would most likely be on scoring as high as possible since the group benefits by the computation of a higher score. The subject can feel secure that her (good) performance will be rewarded by the other members of the group who are, after all, just like her. The situation in the heterogeneous group is just the opposite. Here one cannot be sure that the other people will agree on a fair distribution of the rewards: they might favor their own group (or non-islanders). One could hypothesize then that the potential or certainty of rewards (a monetary gain) would not be enough to serve as an incentive for high performance.

The results of the group receiving the additive instruction (summing each member's performance) were uniformly high for both homogeneous and heterogeneous groups, although the trend is clearly that hetereogenous groups do better than homogeneous ones. This finding is in accord with much of the research on group performance (cf. Ziller, 1976). The effect (additive groups performing rather well) is reinforced by the knowledge that an individual's high level of performance may compensate for poor performance by another, thereby benefiting the group.

The groups that received conjunctive instructions performed

uniformly lower than the other groups. In the homogeneous condition, scoring may be surpressed again out of a feeling of group solidarity. That is, since scoring is in terms of the poorest member, one may not wish to make the contrast between that person scoring lowest and subject excessively large. If the differences were large, it might be obvious who scored lowest and who did the best.

The simple motor task (construction) creates a different situation. This is a task in which it is relatively easy to judge the level of one's performance and estimate the best in a known group. If subjects know that the group's score will be based on the best individual performance (disjunctive) and feels that the differences between group members will be small, they are likely to do their best--again so that no one person has to be responsible for the group. Also, one could hypothesize that imaginal group fascilatation could occur as in Triplett's classic 1897 study. When you know little about the group, the need to reduce intra-group differences is of little saliency.

On the other hand, when the situation favors the least able of the group, or the likelihood that the group might favor such a person is high, the tendency would be to avoid embarrassing the low performer. In a heterogeneous group, this social restriction would not be present with the consequent elevation of scores.

In the word task, the tendency to reduce intra-group variation is more evident. This is a completely open ended task (that is, there are a very large number of words that can be constructed) with wide perceived variation in individual

abilities. So, even if you think you are good at the game, the wisest course (for the group) would be to surpress performance. With no obligation to the group members, this constraint would be removed---and it would be particularly absent in the discrepant condition when the others might be particularly reluctant to disfavor an outstanding performance. One might also hypothesize that this particularly verbal game would bring out a spirit of group competitiveness which would be unusally salient among Asian-Americans.

Methodologically, this study presents an experimental situation in which many of the effects of group performance can be studied without the uncontrolled variables created by the presence of other persons. The fact that the general superiority of heterogeneous groups over homogeneous ones was replicated, even in the absence of those groups lends support to the usefullness of the methodology.

The interaction of type of task with other variables is an interesting finding that merits additional investigation. Rarely have investigators looked for such task interactions, apparently believing that the effects were at best linear. Life is more complicated than that. Certainly, we shall need to analyze more carefully the nature of the task before making predictions about the impact of group composition and instruction manipulations.

References

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*, 117-140.

Freedman, J. L., Klevansky, S., & Ehrlich, P. R. (1971). The effects of crowding on human task performance. *Journal of Applied Social Psychology*, *1*, 7-25.

Gurnee, H. (1937). Maze learning in the collective situation. *Journal of Psychology*, *3*, 437-443.

Heslin, R. (1964). Predicting group task effectiveness from member characteristics. *Psychological Bulletin*, *62*, 248-256.

Hoffman,J.L. & Betkouski,M (1981). An assessment of the Myers-Briggs Type Indicator research applications in education. *Research in Psychological Types*. Vol.3, 31-41.

Hoffman, L. R., & Maier, N. R. F. (1961). Quality and acceptance of problem solutions by members of homogeneous and heterogeneous groups. *Journal of Abnormal and Social Psychology*, *62*, 401-407.

Kent, R. N., & McGarth, J. E. (1969). Task and group characteristics as factors influencing group performance. *Journal of Experimental Social Psychology*, *5*, 429-440.

Landis, D., & Slivka, R. M. (1972). Displays for decision making. *International Journal of Production Research*, *10*, 215-228.

Lord, R. B. (1976). Group performance as a function of leadership behavior and task structure: Toward an explanatory theory. *Organizational Behavior and Human Performance*, *17*, 76-96.

McInturff, D., Campos, P. E., Irving, A., & Landis, D. (1983). Influences on group productivity I: Factors inherent in the task a bibliographic synopsis. (ONR Tech. Rep. No. 83-2). Indianapolis: Purdue University School of Science, Center for Applied Research and Evaluation.

Naisbitt, J. (1982). Megatrends: Ten New Directions Transforming our Lives. New York: Warner Books.

Osato, S., Campos, P. E., Goodman, N., & Landis, D. (1983). Influences on group productivity II: Factors inherent in the person a bibliographic synopsis. (ONR Tech. Rep. No. 83-3). Indianapolis: Purdue University School of Science, Center for Applied Research and Evaluation.

Pelz, D.C. & Andrews, F.M. (1976). Scientists in Organizations. Ann Arbor, Michigan. Institute for Social Research.

Pepinsky, P. N., Pepinsky, H. B., & Pavlik, W. B. (1960). The effects of task complexity and time pressure upon team productivity. Journal of Applied Psychology, 44, 34-38.

Schacter, S., Ellerston, N., McBride, D., & Gregory, D. (1951). An experimental study of cohesiveness and productivity. Human Relations, 4, 229-238.

Spekke, A.A. (Ed) (1975). The Next 25 years: Crisis & Opportunity. Washington, D.C. World Future Society.

Steiner, I. D. (1982). Group Process and Productivity. New York: Academic Press.

Toffler, A. (1980). The Third Wave. New York: Bantam Books.

Triplett, N. (1897). The dynamogenic factors in pacemaking and competition. American Journal of Psychology, 9, 507-533.

Ziller, R. C. (1976). Homogeneity and heterogeneity of group membership. In C. G. McClintock (Ed.), Experimental Social Psychology (pp. 385-411). New York: Holt, Rinehart and Winston, Inc.

Table 1

Mean Differences for each Group-Instruction Subclass on the Map Task

Means	HOM-DCR (.595)	HET-DJN (.306)	HET-ADD (.298)	HOM-ADD (.244)	HOM-CON (-.204)	HET-CON (-.241)	HOM-DJN (-.477)	HET-DCR (-.522)
HOM-DCR(.595)		.289	.297	.351	.799**	.836**	1.072**	1.117**
HET-DJN(.306)			.008	.062	.510*	.547*	.783**	.828**
HET-ADD(.298)				.054	.502*	.539*	.775**	.820**
HOM-ADD(.244)					.448*	.485*	.721**	.766**
HOM-CON(-.204)						.037	.273	.318
HET-CON(-.241)							.236	.281
HOM-DJN(-.477)								.045

*$p < .05$. **$p < .01$.

Note. Legend for abbreviations: HOM=Homogeneous HET=Heterogeneous DCR=Discriminant DJN=Disjunctive ADD=Additive CON=Conjunctive.

Table 2

Mean Differences for each Group-Instruction Subclass on the Word Task

Means	HET-DCR (.750)	HET-CON (.188)	HET-ADD (.175)	HET-DJN (.004)	HOM-DCR (-.029)	HOM-DJN (-.110)	HOM-ADD (-.421)	HOM-CON (-.548)
HET-DCR(.750)		.562	.575	.746*	.779*	.860*	1.171**	1.298**
HET-CON(.188)			.013	.184	.217	.298	.609	.736*
HET-ADD(.175)				.171	.204	.285	.596	.723*
HET-DJN(.004)					.033	.114	.425	.552
HOM-DCR(-.029)						.081	.392	.519
HOM-DJN(-.110)							.311	.438
HOM-ADD(-.421)								.127

*$p < .05$. **$p < .01$.

Note. Legend for abbreviations: HET=Heterogeneous HOM=Homogeneous DCR=Discriminant CON=Conjunctive ADD=Additive DJN=Disjunctive.

Table 3

Mean Differences for each Group-Instruction Subclass on the Construction Task

Means	HOM-DJN (.751)	HET-CON (.396)	HET-DCR (.339)	HOM-CON (-.104)	HET-DJN (-.149)	HET-ADD (-.288)	HOM-ADD (-.432)	HOM-DCR (-.514)
HOM-DJN(.751)		.355	.412	.855**	.900**	1.039**	1.183**	1.265**
HET-CON(.396)			.057	.500*	.545*	.684*	.828**	.910**
HET-DCR(.339)				.443	.488	.627*	.771**	.853**
HOM-CON(-.104)					.045	.184	.328	.410
HET-DJN(-.149)						.139	.283	.365
HET-ADD(-.288)							.144	.226
HOM-ADD(-.432)								.082

$^{*}p < .05$. $^{**}p < .01$.

Ncte. Legends for abbreviations: HOM=Homogeneous HET=Heterogeneous DJN=Disjunctive CON=Conjunctive DCR=Discriminant ADD=Additive.

Figure Caption

Figure 1. Group differences on the three tasks following discrepant information.

DISCREPANT INSTRUCTIONS

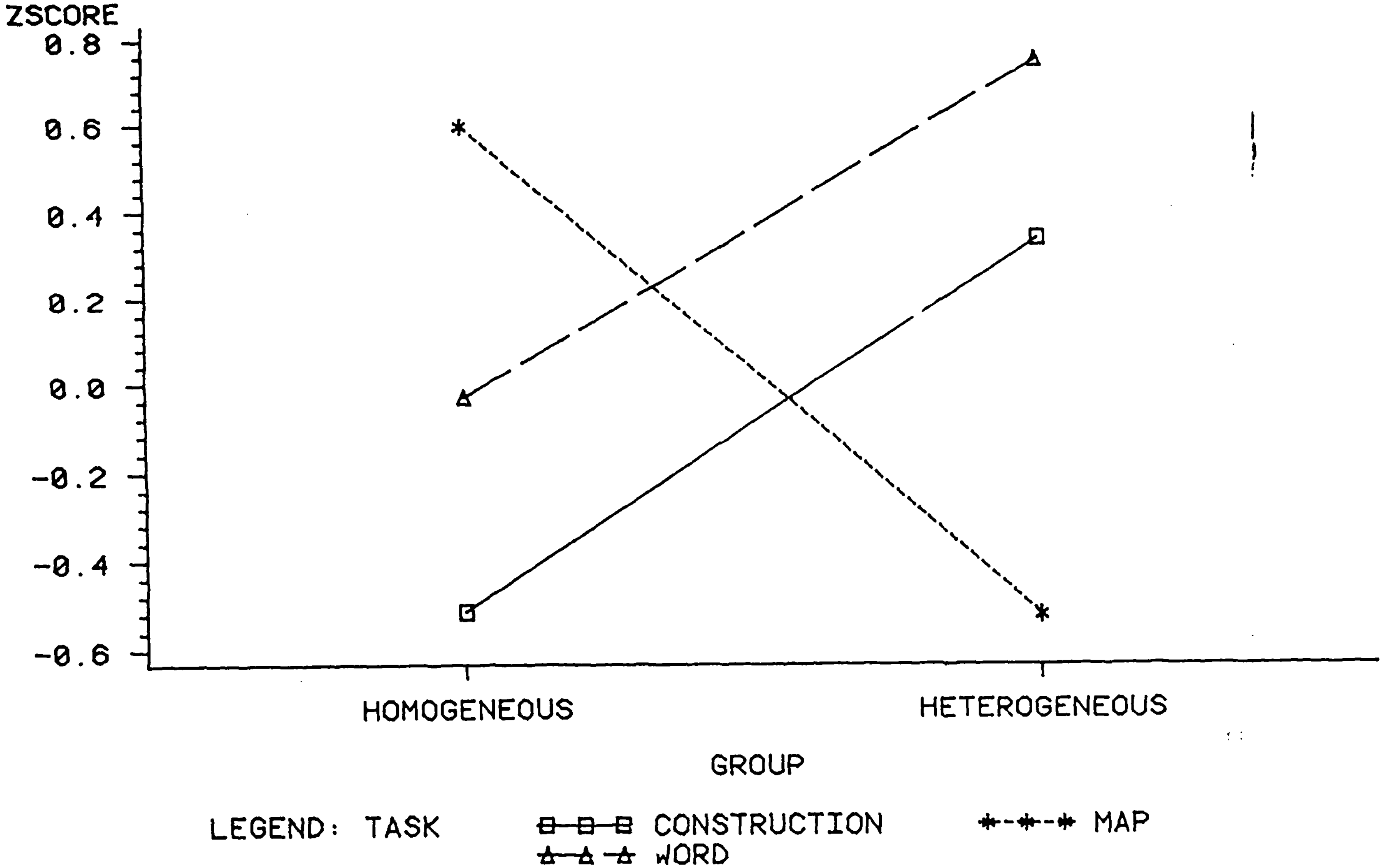
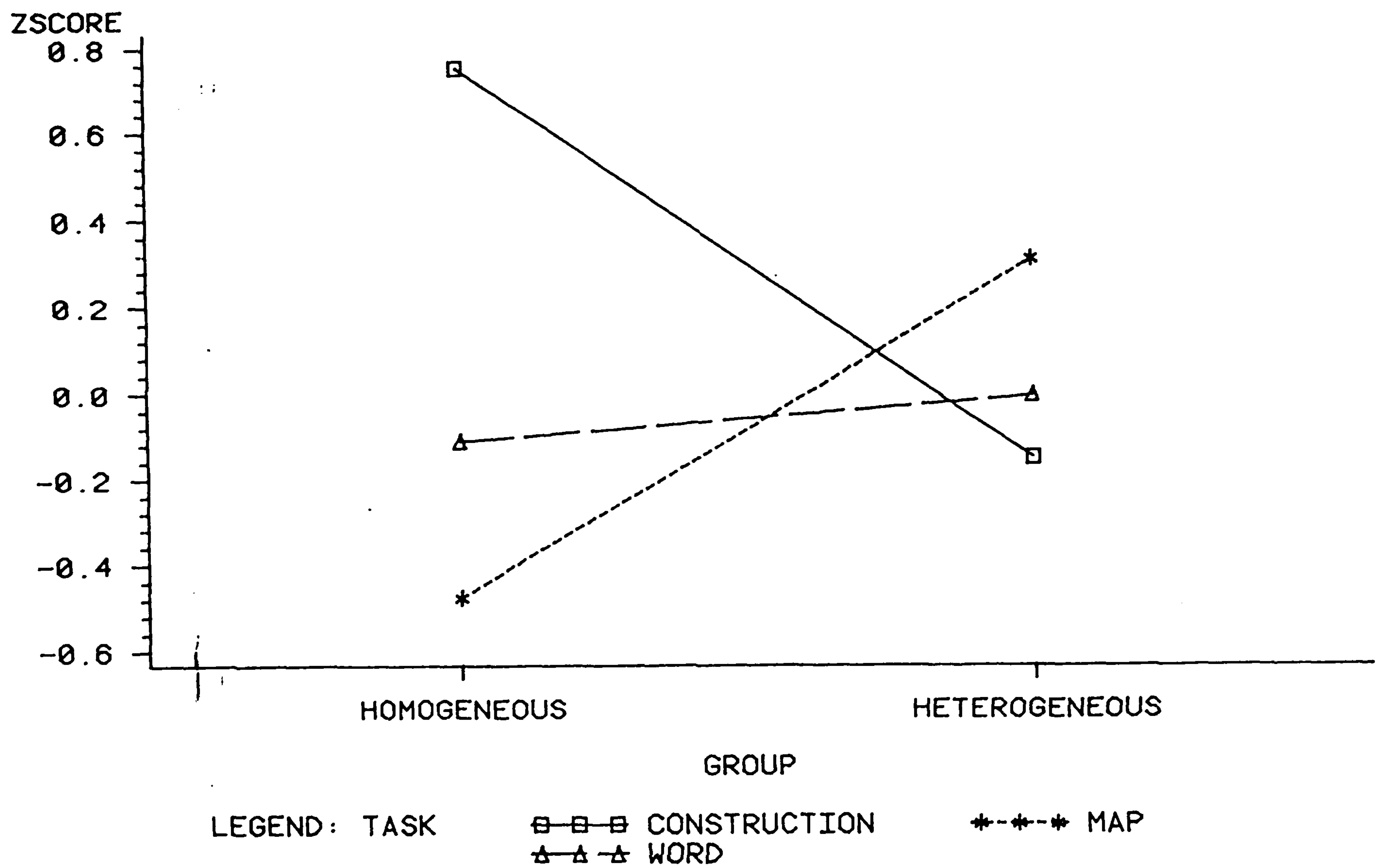


Figure Caption

Figure 2. Group differences on the three tasks following disjunctive instructions.

DISJUNCTIVE INSTRUCTIONS



LIST 1
MANDATORY

Defense Technical Information Center
ATTN: DTIC DDA-2
Selection and Preliminary Cataloging Section
Cameron Station
Alexandria, VA 22314

Library of Congress
Science and Technology Division
Washington, D.C. 20540

Office of Naval Research
Code 4420E
800 N. Quincy Street
Arlington, VA 22217

Naval Research Laboratory
Code 2627
Washington, D.C. 20375

Office of Naval Research
Director, Technology Programs
Code 200
800 N. Quincy Street
Arlington, VA 22217

LIST 2
ONR Field

Psychologist
Office of Naval Research
Detachment, Pasadena
1030 East Green Street
Pasadena, CA 91106

Dr. James Lester
Office of Naval Research
Detachment, Boston
495 Summer Street
Boston, MA 02219

LIST 3
OPNAV

Deputy Chief of Naval Operations
(Manpower, Personnel, and Training)
Head, Research, Development, and
Studies Branch (Op-115)
1812 Arlington Annex
Washington, D.C. 20350

Director
Civilian Personnel Division (OP-14)
Department of the Navy
1803 Arlington Annex
Washington, D.C. 20350

Deputy Chief of Naval Operations
(Manpower, Personnel, and Training)
Director, Human Resource Management
Plans and Policy Branch (Op-150)
Department of the Navy
Washington, D.C. 20350

Chief of Naval Operations
Head, Nanpower, Personnel,
Training and Reserves Team
(Op-964D)
The Pentagon, 4A478
Washington, D.C. 20350

Chief of Naval Operations
Assistant, Personnel Logistics
Planning (Op-987H)
The Pentagon, 5D772
Washington, D.C. 20350

LIST 4
NAVMAT & NPRDC

NAVMAT

Program Administrator for Manpower,
Personnel, and Training
MAT-0722
800 N. Quincy Street
Arlington, VA 22217

Naval Material Command
Management Training Center
NAVMAT 09M32
Jefferson Plaza, Bldg #2, Rm 150
1421 Jefferson Davis Highway
Arlington, VA 20360

Naval Material Command
MAT-OOK & MAT-OOKB
OASN(SNL)
Crystal Plaza #5
Room 236
Washington, D.C. 20360

Naval Material Command
MAT-03
(J. E. Colvard)
Crystal Plaza #5
Room 236
Washington, D.C. 20360

NPRDC

Commanding Officer
Naval Personnel R&D Center
San Diego, CA 92152

Naval Personnel R&D Center
Dr. Robert Penn
San Diego, CA 92152

Naval Personnel R&D Center
Dr. Ed Aiken
San Diego, CA 92152

Navy Personnel R&D Center
Washington Liaison Office
Building 200, 2N
Washington Navy Yard
Washington, D.C. 20374

LIST 6
NAVAL ACADEMY AND NAVAL POSTGRADUATE SCHOOL

Naval Postgraduate School
ATTN: Dr. Richard S. Elster (Code 012)
Department of Administrative Sciences
Monterey, CA 93940

Naval Postgraduate School
ATTN: Professor John Senger
Operations Research and
Administrative Science

Superintendent
Naval Postgraduate School
Code 1424
Monterey, CA 93940

Naval Postgraduate School
Code 54-Aa
Monterey, CA 93940

Naval Postgraduate School
ATTN: Dr. Richard A. McGonigal
Code 54
Monterey, CA 93940

U.S. Naval Academy
ATTN: CDR J. M. McGrath
Department of Leadership and Law
Annapolis, MD 21402

Professor Carson K. Eoyang
Naval Postgraduate School, Code 54EG
Department of Administrative Sciences
Monterey, CA 93940

Superintendent
ATTN: Director of Research
Naval Academy, U.S.
Annapolis, MD 21402

LIST 7
HRM

Officer in Charge
Human Resource Management Detachment
Naval Air Station
Alameda, CA 94591

Officer in Charge
Human Resource Management Detachment
Naval Submarine Base New London
P. O. Box 81
Groton, CT 06340

Officer in Charge
Human Resource Management Division
Naval Air Station
Mayport, FL 32228

Commanding Officer
Human Resource Management Center
Pearl Harbor, HI 96860

Commander in Chief
Human Resource Management Division
U.S. Pacific Fleet
Pearl Harbor, HI 96860

Officer in Charge
Human Resource Management Detachment
Naval Base
Charleston, SC 29408

Commanding Officer
Human Resource Management School
Naval Air Station Memphis
Millington, TN 38054

Human Resource Management School
Naval Air Station Memphis (96)
Millington, TN 38054

Commanding Officer
Human Resource Management Center
1300 Wilson Boulevard
Arlington, VA 22209

Commanding Officer
Human Resource Management Center
5621-23 Tidewater Drive
Norfolk, VA 23511

Commander in Chief
Human Resource Management Division
U.S. Atlantic Fleet
Norfolk, VA 23511

Officer in Charge
Human Resource Management Detachment
Naval Air Station Whidbey Island
Oak Harbor, WA 98278

Commanding Officer
Human Resource Management Center
Box 23
FPO New York 09510

Commander in Chief
Human Resource Management Division
U.S. Naval Force Europe
FPO New York 09510

Officer in Charge
Human Resource Management Detachment
Box 60
FPO San Francisco 96651

Officer in Charge
Human Resource Management Detachment
COMNAVFORJAPAN
FPO Seattle 98762

LIST 8
NAVY MISCELLANEOUS

Naval Military Personnel Command
HRM Department (NMPC-6)
Washington, D.C. 20350

LIST 15
CURRENT CONTRACTORS

Dr. Clayton P. Alderfer
Yale University
School of Organization and Management
New Haven, Connecticut 06520

Dr. Richard D. Arvey
University of Houston
Department of Psychology
Houston, TX 77004

Dr. Stuart W. Cook
Institute of Behavioral Science #6
University of Colorado
Box 482
Boulder, CO 80309

Dr. L. L. Cummings
Kellogg Graduate School of Management
Northwestern University
Nathaniel Leverone Hall
Evanston, IL 60201

Dr. Richard Daft
Texas A&M University
Department of Management
College Station, TX 77843

Bruce J. Bueno De Mesquita
University of Rochester
Department of Political Science
Rochester, NY 14627

Dr. Henry Emurian
The Johns Hopkins University
School of Medicine
Department of Psychiatry and
Behavioral Science
Baltimore, MD 21205

Dr. Arthur Gerstenfeld
University Faculty Associates
710 Commonwealth Avenue
Newton, MA 02159

Dr. Paul S. Goodman
Graduate School of Industrial
Administration
Carnegie-Mellon University
Pittsburgh, PA 15213

Dr. J. Richard Hackman
School of Organization
and Management
Box 1A, Yale University
New Haven, CT 06520

Dr. Herry Hunt
College of Business Administration
Texas Tech. University (Box 4320)
Lubbock, TX 79409

Dr. Lawrence R. James
School of Psychology
Georgia Institute of Technology
Atlanta, GA 30332

Dr. F. Craig Johnson
Department of Educational Research
Florida State University
Tallahassee, FL 32306

Dr. Allan P. Jones
University of Houston
4800 Calhoun
Houston, TX 77004

Dr. Dan Landis
Department of Psychology
Purdue University
Indianapolis, IN 46205

Dr. Frank J. Landy
The Pennsylvania State University
Department of Psychology
417 Bruce V. Moore Building
University Park, PA 16802

Dr. Bibb Latane
The University of North Carolina
at Chapel Hill
Manning Hall 026A
Chapel Hill, NC 27514

Dr. Edward E. Lawler
University of Southern California
Graduate School of Business Administration
Los Angeles, CA 90007

Dr. Edwin A. Locke
College of Business and Management
University of Maryland
College Park, MD 20742

Dr. Fred Luthans
Regents Professor of Management
University of Nebraska-Lincoln
Lincoln, NE 68588

LIST 15 (CONTINUED)

Dr. R. R. Mackie
Human Factors Groups
5775 Dawson Street
Goleta, CA 93117

Dr. William H. Mobley
College of Business Administration
Texas A&M University
College Station, TX 77843

Dr. Lynn Oppenheim
Wharton Applied Research Center
University of Pennsylvania
Philadelphia, PA 19104

Dr. Thomas M. Ostrom
The Ohio State University
Department of Psychology
116E Stadium
404C West 17th Avenue
Columbus, OH 43210

Dr. William G. Ouchi
University of California,
Los Angeles
Graduate School of Management
Los Angeles, CA 90024

Dr. Charles Perrow
Yale University
I. S. P. S.
111 Prospect Avenue
New Haven, Connecticut 06520

Dr. Irwin G. Sarason
University of Washington
Department of Psychology, NI-25
Seattle, WA 98195

Dr. Benjamin Schneider
Department of Psychology
University of Maryland
College Park, MD 20742

Dr. Edgar H. Schein
Massachusetts Institute of Technology
Sloan School of Management
Cambridge, MA 02139

H. Ned Seelye
International Resource Development, Inc.
P. O. Box 721
La Grange, IL 60525

Dr. H. Wallace Sinaiko
Program Director, Manpower Research
and Advisory Services
Smithsonian Institution
801 N. Pitt Street, Suite 120
Alexandria, VA 22314

Dr. Richard M. Steers
Graduate School of Management
University of Oregon
Eugene, OR 97403

Dr. Siegfried Streufert
The Pennsylvania State University
Department of Behavioral Science
Milton S. Hershey Medical Center
Hershey, PA 17033

Dr. James R. Terborg
University of Oregon West Campus
Department of Management
Eugene, OR 97403

Dr. Harry C. Triandis
Department of Psychology
University of Illinois
Champaign, IL 61820

Dr. Howard M. Weiss
Purdue University
Department of Psychological Sciences
West Lafayette, IN 47907

Dr. Philip G. Zimbardo
Stanford University
Department of Psychology
Stanford, CA 94305

Dr. Philip Wexler
University of Rochester
Graduate School of Education
and Human Development
Rochester, NY 14627

END

FILMED

4-85

DTIC